AMENDMENTS TO AND LIST OF THE CLAIMS:

Please cancel Claims 1-33 of record and substitute new Claims 34-54 as follows:

Claims 1-33: (cancelled)
Claims 34-54 (new)

34. A mass spectrometer based on the use of a plurality of quadrupole lenses with angular gradient of the electrostatic field between adjacent quadrupole lens of said plurality, said mass spectrometer comprising:

an ion source with an ion outlet for emission of ions of a substance to be analyzed;

an ion mass separation chamber sealingly connected to said ion source and receiving said ions from said ion source, said ion mass separation chamber having electrostatic field generation means for generating an electrostatic field, said electrostatic field generation means comprising a plurality of quadrupole electrostatic lenses which are arranged in series and coaxially in said direction of propagation and form a central ion-guiding channel for propagation of said ions, each of said quadrupole electrostatic lenses comprising a circular body formed by four arch-shaped poles located substantially in a common plane perpendicular to said longitudinal axis and arranged circumferentially about said longitudinal axis in the form of a first pair composed of two diametrically opposite and electrically connected poles and a second pair composed of two diametrically opposite and electrically connected poles, in each of said quadrupole electrostatic lenses said poles being angularly shifted with respect to said poles of a quadrupole electrostatic lens subsequent in said direction of propagation by a selected angle in order to provide said angular gradient of the electrostatic field between adjacent quadrupole lenses of said plurality and thus to cause said ions to move along helical trajectories;

mirror means comprising: an electrostatic mirror for reflecting said ions in a reverse direction opposite to said direction of propagation for dividing said helical trajectories into a direct section for movement of said ions in said direction of propagation and a reverse section for movement of said ions in a direction opposite to said direction of propagation; and a magnetic mirror for scattering ions of different mass in order to prevent them from returning along the same helical trajectories in which they traveled in said direct section, said electrostatic mirror and said magnetic mirror being located at the end of said direct section;

an ion-electron emitting screen located on the path of said ions in said reverse section for secondary reflection of said ions towards said direction of propagation; and

an ion detector located at the end of said reverse section and having ion detecting means for detecting positions of collision of said ions with said ion-electron emitting screen over time and space.

35. The mass spectrometer of Claim 34, wherein said selected angle is equal to 360° divided by the number of quadrupole electrostatic lenses in said plurality.

36. The mass spectrometer of Claim 35, further comprising: a first power source having a negative terminal, a positive terminal, and a midpoint between said negative terminal and said positive terminal; and a second power source having a negative terminal and a positive terminal; said first pair of two diametrically opposite poles being connected to said positive terminal of said first power source via a first resistor, said second pair of two diametrically opposite poles being connected to said negative terminal of said first power source, said midpoint of said first power source being connected to said negative terminal of said second power source via a second resistor, said positive terminal of said second power source being grounded, said second power source generating a current of a high voltage which is higher than voltage of said first power source; said high voltage decreasing from one quadrupole electrostatic lenses to another quadrupole electrostatic lenses in said direction of propagation.

37. The mass spectrometer of Claim 36, wherein in said direct section radii of said helical trajectory gradually increase, and on said reverse section radii of said helical trajectory gradually decrease.

38. The mass spectrometer of Claim 36, wherein each said quadrupole electrostatic lens is assembled from a first disk member and a second disk member which are identical, electrically isolated from each other, and are assembled in mirror positions with respect to each other, said first disk member having said first pair of two diametrically opposite poles, said second disk member having said second pair of two diametrically opposite poles, said first pair of diametrically opposite poles being angularly shifted with respect to said second pair of diametrically opposite poles by 90°.

39. The mass spectrometer of Claim 38, wherein said first disk member has at least one pocket for accommodation of said first resistor, and wherein said second disk member has at least one pocket for accommodation of said second resistor.

40. The mass spectrometer of Claim 34, wherein said ion detector comprises at least one micro-channel plate.

41. The mass spectrometer of Claim 40, wherein said ion detector is provided with position adjustment means for adjusting position of said detector in matched conditions of the most optimum performance.

42. The mass spectrometer of Claim 38, wherein said ion detector comprises at least one micro-channel plate.

43. The mass spectrometer of Claim 42, wherein said ion detector is provided with position adjustment means for adjusting position of said detector in match conditions of the most optimum performance.

44. The mass spectrometer of Claim 34, wherein said electrostatic mirror means comprise at least one electrostatic mirror coaxial with said quadrupole electrostatic lenses and located after the last quadrupole electrostatic lens in said ion propagation direction.

45. The mass spectrometer of Claim 44, wherein said at least one electrostatic mirror comprises a continuous ring with a positive potential applied from a first [powder] power source, said at least one electrostatic mirror being provided with a potential adjustment means.

46. The mass spectrometer of Claim 36, wherein said electrostatic mirror means comprise at least one electrostatic mirror coaxial with said quadrupole electrostatic lenses and located after the last quadrupole electrostatic lens in said ion propagation direction.

47. The mass spectrometer of Claim 46, wherein said at least one electrostatic mirror comprises a continuous ring with a positive potential applied from a first [powder] power source, said at least one electrostatic mirror being provided with a potential adjustment means.

48. The mass spectrometer of Claim 38, wherein said electrostatic mirror means comprise at least one electrostatic mirror coaxial with said quadrupole electrostatic lenses and located after the last quadrupole electrostatic lens in said ion propagation direction.

49. The mass spectrometer of Claim 48, wherein said at least one electrostatic mirror comprises a continuous ring with a positive potential applied from a first [powder] power source, said at least one electrostatic mirror being provided with a potential adjustment means.

50. The mass spectrometer of Claim 34, further comprising a magnetic mirror which is located at the end of said ion mass separation chamber and consists of a plurality of permanent magnets arranged circumferentially around said end of ion mass separation chamber and a permanent magnet at the end face of said ion mass separation chamber.

51. The mass spectrometer of Claim 38, further comprising a magnetic mirror which is located at the end of said ion mass separation chamber and consists of a plurality of permanent magnets arranged circumferentially around said end of ion mass separation chamber and a permanent magnet at the end face of said ion mass separation chamber.

52. The mass spectrometer of Claim 45, further comprising a magnetic mirror which is located at the end of said ion mass separation chamber and consists of a plurality of permanent magnets arranged circumferentially around said end of ion mass separation chamber and a permanent magnet at the end face of said ion mass separation chamber.

53. The mass spectrometer of Claim 47, further comprising a magnetic mirror which is located at the end of said ion mass separation chamber and consists of a plurality of permanent magnets arranged circumferentially around said end of ion mass separation chamber and a permanent magnet at the end face of said ion mass separation chamber.

54. The mass spectrometer of Claim 49, further comprising a magnetic mirror which is located at the end of said ion mass separation chamber and consists of a plurality of permanent magnets arranged circumferentially around said end of ion mass separation chamber and a permanent magnet at the end face of said ion mass separation chamber.